

Low Glycaemic Index Foods



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Signs and symptoms of diabetes mellitus

- Polyuria - Frequent urination
- Polyphagia - Excessive thirst
- Polydipsia - Extreme hunger

Weight loss.

Tiredness.

Dry skin.

Sudden vision changes, blurred vision.

Tingling or numbness in the hands or feet.

Slow healing of cuts and wounds.

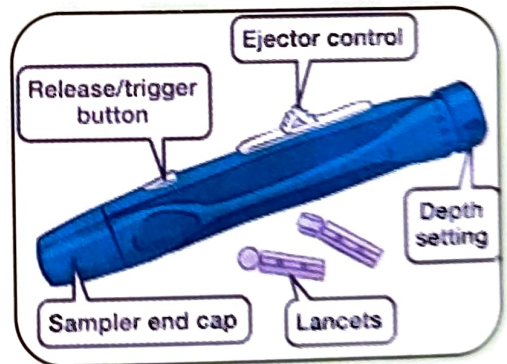
Normal Blood Glucose Values

- Fasting Blood Glucose : 80 to 120 mg / dl
- Post meal : 120 to 180 mg / dl
- Glycated Haemoglobin (HbA1c) : 6.0 to 7.5 %

Blood sugar testing kit



One Touch Glucometer



One touch Penlet



Finger Pricker lancet

LOW GLYCAEMIC INDEX FOODS

Diet and nutrition are important factors in the promotion and maintenance of good health at every stage of human life cycles. Recently, rapid socioeconomic changes, along with declines in food prices, increased access to foods and urbanization have resulted in a “nutritional transition” which characterized by a shift from primitive mode of nutrition to more energy-dense diets and reduction in physical activity. Nutrition transition is characterized by increases in consumption of high fat, energy-dense foods, processed foods high in sugar, animal-based food products, and decrease in the consumption of plant-based food products like fruits, vegetables and whole grains. Evidence has shown that nutritional transition is negatively associated with health status, and it has been implicated as the major factors responsible for the increases in prevalence of diet-related diseases, such as obesity, diabetes and cardiovascular diseases worldwide.

Diabetes Mellitus is a silent disease and is now recognized as one of the fastest growing threat to public health in almost all countries of the world. Around 150 million people suffer from diabetes in the world, of which about 35 million are Indians.

India has the largest diabetic population, over 220 million people worldwide have diabetes. India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the “diabetes capital of the world”. It was estimated that there are approximately 33 million adults with diabetes in India. India is the diabetes capital with home to 69.1 million people with DM, the second highest number of cases after China.

Diabetes cannot be cured completely but it can be kept under control by using combination of diet, drugs and exercise. Proper diet helps in maintaining normal blood sugar level in diabetes. It is recognized that a good control over blood sugar level is essential for prevention or postponement of long term complications of diabetes. Since foods of low glycemic index and high fibre content raise the blood sugar to a lesser extent thus diabetic diets can be planned considering these two factors.

The glycaemic index (GI) ,a dietary measuring system relating the rate at which carbohydrate-containing foods raises blood sugar after two (2) hours or more of food consumption (post-prandial glycaemia), has clinically important

benefits for preventing, managing, and treating a number of chronic diseases such as diabetes, cardiovascular disease (CVD), and some forms of cancer and obesity.

The concept of glycemic index (GI) was developed to help diabetic patients with blood glucose control when it was evident that high GI food consumption was associated with an increased risk of type 2 diabetes mellitus. Epidemiological and dietary intervention studies suggest that a low-GI diet is beneficial for blood glucose control and consumption of foods with a high GI or glycemic load (GL) is hypothesized to contribute to insulin resistance, which is associated with an increased risk of DM, obesity, cardiovascular disease, and some cancers. Glycemic index of food is useful in planning the diet for diabetic because there is vast difference in glycemic index of different foods having similar amount of carbohydrate content in them. Glycaemic index is an important tool used in treating people with diabetes and in weight loss programs. Low glycaemic index foods, by virtue of the slow digestion and absorption of carbohydrates, produces gradual rise in blood sugar and insulin levels and are increasingly associated with health benefits. Low glycaemic index foods have shown to improve the glucose tolerance in both healthy and diabetic subjects. Utilization of the low glycemic index and high fibre foods in the diet of diabetics should be included to maintain the glucose level and for long term control of diabetes. Therefore, traditional recipes were modified with incorporation of low glycemic index foods and glycemic index was determined.

Glycaemic index

Glycemic index (GI) describes the blood glucose response after consumption of a carbohydrate containing test food relative to a carbohydrate containing reference food, glucose.

Carbohydrate-containing foods are graded as either having a high, intermediate (medium) or low GI depending on the rate at which blood sugar level rises which in turn is related to the rate of digestion and absorption of sugars and starches available in that food.

Classification of Glycemic Index

Low GI = 55 or less

Medium GI = 56 - 69

High GI = 70 or more

$$\text{Formula : GI} = \frac{\text{Area under curve of glucose}}{\text{Area under curve of test food}} \times 100$$

Glycaemic index of the selected foods

S.No.	Name of the Food	Glycaemic Index	
01	Cereals &	Barley (Jav)	25
02	Millets	Wheat	38
03		Barnyard millet (Bhagar)	49
04		Pearl millet (Bajri)	49
05		Horse gram (Kulith)	51
06		Finger millet (Ragi)	84
07	Pulses	Bengal gram dhal	16
08		Soyabean	18-25
09		Lentil	29
10		Green gram	38
11		Chick pea	42
12		Black gram	48
13	Vegetables &	Cabbage	10
14	Fruits	Coriander leaves	15
15		Cucumber	15
16		Brinjal	15
17		Cauliflower	15
18		Spinach	15
19		Tomato	15
20		Jamun	25
21		Apple	38
22		Orange	42
23		Carrot	47
24		Banana	53
25		Dates	30
26	Nuts and	Groundnut	14
27	Oil Seed	Flax seed	14
28		Coconut	35
29		Sesame seed	35
30	Milk &	Curd	14
31	Milk Products	Milk	31
32	Condiments &	Fenugreek seed	5-10
33	Spices	Black pepper	15
34		Garlic	32
35		Coriander seed	35

Low Glycaemic Index Foods

Millet Namkeen

Developed new recipe from uncommonly used millets. Barnyard millets are high in fibre content, phosphorous and calcium. Barnyard has low glycemic index.

Consumption of finger millet based diets helps in lowering plasma glucose levels due to high fiber content and the presence of anti-nutritional factors which are known to reduce starch digestibility and absorption.

Thus low glycemic index value barnyard millet and finger millet are utilized in designing therapeutic, nutritious and acceptable food products as an effective supportive therapy in treatment of diabetes mellitus



Ingredients	Amount
Puffed Barnyard Millet	15 g
Puffed Rajkeera	10 g
Puffed Ragi	10 g
Groundnut	05 g
Coconut	03 g
Gingelly seeds	02 g
Green chillies	03 g
Curry leaves	02 g

Method of Preparation

- ◆ Heat the oil in a pan.
- ◆ Add groundnut, gingelly seeds, green chillies, curry leaves and turmeric powder.
- ◆ Add puffed Barnyard millets, Rajkeera, Ragi, salt and mix well.

Glycaemic index : 34.53

Nutrient Composition of Millet Namkeen

Moisture (g)	Fat (g)	Ash (g)	Protein (g)	Total CHO (%)	Energy (Kcal)	Crude Fibre (g)	Iron (mg)	Calcium (mg)	Zinc (mg)	Phosphorus (mg)
8.77	8.83	1.42	8.75	53.54	388.08	2.75	5.55	144	0.98	349

Mix Pulse Roll

Lentil had the slowest rate of hydrolysis of starches, and the lowest estimated glycemic index value similarly green gram dal had the high amount of fiber and low glycemic index value. It digests slowly and gradually releases glucose into bloodstream, stabilizing blood sugar. Since green gram dhal prolongs the release of sugar into bloodstream, it can help to curb post-meal cravings. Lentil and green gram dhal low glycaemic index foods were used in the development of recipe as the consumption of low-glycemic foods lower risk for developing diabetes.

Ingredients	Amount
Bengal gram flour	45 g
Lentil dhal flour	20 g
Green gram dhal flour	20 g
Coconut	05 g
Coriander leaves	05 g
Green chilies	2.5 g
Ginger fresh	2.5 g
Curd	20 g



Method of Preparation

- ◆ Prepare Bengal gram ,lentil and green gram dhal flour.
- ◆ Mix all the flours and paste of green chilies and ginger in a butter milk thoroughly.
- ◆ Cook till required consistency.
- ◆ Grease the plate and spread thin layer of the mixture evenly.
- ◆ Allow it to cool.
- ◆ Sprinkle chopped fresh coriander leaves and grated coconut.
- ◆ Cut the strips and roll it.

Glycaemic index : 36.96

Nutrient Composition of Mix Pulse Roll

Moisture (g)	Fat (g)	Ash (g)	Protein (g)	Total CHO (%)	Energy (Kcal)	Crude Fibre (g)	Iron (mg)	Calcium (mg)	Zinc (mg)	Phosphorus (mg)
25.09	0.337	2.77	20.12	56.61	349.89	1.42	5.25	112	1.98	322

Millet Mix

It is newly developed recipe prepared with puffed barnyard millet, puffed rajkeera, puffed ragi, groundnut, coconut, skimmed milk powder and fresh dates. Barnyard millets are high in fibre content, phosphorous and calcium. Barnyard has low glycemic index and thus helps in type 2 diabetes, cardiovascular disease. Consumption of finger millet based diets helps in lowering plasma glucose levels due to high fiber content and the presence of anti-nutritional factors which are known to reduce starch digestibility and absorption.

The consumption of dates by healthy or diabetic individuals does not result in "significant postprandial glucose excursion," otherwise known as blood sugar spikes. Dates have a low-glycemic index and did not raise blood sugar levels significantly; after they were eaten. Apart from having high amounts of energy and carbohydrates, dates are also extremely rich in dietary fiber. Most of the fiber present in dates is in the insoluble form, which adds roughage to the digestive system. This helps to lower cholesterol, keep blood sugar in control, and aid weight loss.



Ingredients	Amount
Puffed Barnyard Millet	10 g
Puffed Rajkeera	10 g
Puffed Ragi	10 g
Groundnut	10 g
Coconut	10 g
Skimmed milk powder	10 g
Dates	40 g

Method of Preparation

- ◆ Roast groundnut and grated coconut, make powder.
- ◆ Make powder of puffed Barnyard millets, Rajkeera and Ragi.
- ◆ Prepare a paste of fresh dates.
- ◆ Mix all the ingredients well.

Glycaemic index : 30.22

Nutrient Composition of Millet Mix

Moisture (g)	Fat (g)	Ash (g)	Protein (g)	Total CHO (%)	Energy (Kcal)	Crude Fibre (g)	Iron (mg)	Calcium (mg)	Zinc (mg)	Phosphorus (mg)
7.05	2.88	2.55	9.62	43.06	308.8	3.11	4.23	256	1.08	283

Multi Grain Roti

Dhapate recipe is a traditional healthy recipe made from jowar and bengal gram flour. It is modified with incorporation of soyabean and horsegram.

Soybeans have one of the lowest GI values of all the legumes (GI = 14-20), likely because of their higher protein and fat content. Horse gram seed has the ability to reduce post-prandial hyperglycemia by slowing down carbohydrate digestion and reduce insulin resistance by inhibiting protein-tyrosine phosphatase 1 beta enzyme. Horse gram is low in lipid and sodium content, and its slow digestible starch make ideal for diabetic and obesity patients

Ingredients	Amount
Jowarflour	30 g
Bengal gram flour	20g
Soyabean	20 g
Horsegram flour	20 g
Garlic	02 g
Coriander fresh	03 g
Tomato powder	03 g
Cumin seed powder	01 g
Chilli powder	01 g
Salt	As per taste
Oil	



Method of Preparation

- ◆ Roast Bengal gram, Soybean and Horse gram and make a flour.
- ◆ Make dough of all the flours by adding tomato powder, coriander, cumin seeds, chilli, turmeric and salt.
- ◆ Flatten by hand.
- ◆ Cook on tawa by applying oil.

Glycaemic index : 39.77

Nutrient Composition of Mix Pulse Roll

Moisture (g)	Fat (g)	Ash (g)	Protein (g)	Total CHO (%)	Energy (Kcal)	Crude Fibre (g)	Iron (mg)	Calcium (mg)	Zinc (mg)	Phosphorus (mg)
16.60	5.43	1.27	21.0	49.21	326.28	2.47	2.92	196	1.24	338

Multigrain Khichadi

Khichadi is prepared as dinner item in Maharashtra. It is prepared with rice and green gram dhal. It is modified with incorporation of barley and lentil dhal. Barley is nutritious and high in soluble fibre, which helps to reduce the post-meal rise in blood glucose—it lowers the overall GI of a meal. Barley, in general, is the best choice of grain for diabetics as it helps to keep blood sugar levels under control. According to research studies, eating a barley dinner improves insulin sensitivity up to 30%. It lowers glycemic index. Barley contains beta-glucan, an element that has a significant way when it comes to lowering glycemic index and normalizing your body's insulin response. This alone makes it a much healthier than rice. It reduces blood pressure. Like other grains, pearl barley helps to control cholesterol levels and promotes cardiovascular health in general. It lowers blood pressure and reduces the risk of heart disease and stroke. It helps with weight control. Not only does barley contain more dietary fiber, it also takes longer time to digest than many other grains. Therefore, it's a perfect choice for the people who want to lose weight as eating some barley-based meal will make feel full longer.



Ingredients Amount

Ingredients	Amount
Rice	10 g
Barley	10 g
Green gram dhal	10 g
Lentil dhal	05g
Groundnuts	05 g
Tomato fresh	05 g
Green chillies	01 g
Curry leaves	01 g
Coriander fresh	01 g
Coconut	01 g
Cumin seeds	0.5 g
Garlic fresh	0.5 g

Method of Preparation

- ◆ Clean and wash barley, rice, green gram dhal and lentil dhal.
- ◆ Heat the oil in a pan and season with cumin seeds, groundnuts, curry leaves chopped green chillies, garlic, tomato and turmeric.
- ◆ Add soaked barley, washed rice, green gram dhal and lentil dhal.
- ◆ Add water, coconut and salt as per taste. ◆ Cook it well.

Glycaemic index : 40.90

Nutrient Composition of Millet Mix

Moisture (g)	Fat (g)	Ash (g)	Protein (g)	Total CHO (%)	Energy (Kcal)	Crude Fibre (g)	Iron (mg)	Calcium (mg)	Zinc (mg)	Phosphorus (mg)
63.97	4.4	2.6	15.75	50.16	320.66	2.05	3.46	76	0.79	199

The traditional products were modified with incorporation of low glycaemic index food stuffs and evaluated for acceptability, nutritional quality and microbial count. These products were evaluated for sensory attributes, nutrient content and microbial count. The cost of each product was calculated. The clinical implication of these products was carried out on 10 healthy female subjects belonging to age group >18 years and the glycemic index of the developed products was determined. From the results it was observed that all the products are highly acceptable for all the organoleptic parameters. All the products under the study were found to be of low glycaemic index category with GI value <55. The developed products are low glycaemic index hence the inclusion of these developed low GI products in the daily diet is the preferable option for the dietary management of diabetes mellitus.

Recommendation :

Low glycaemic VNMKV developed Low Glycaemic Index products viz Mix Pulse Roll (GI 36.96), Millet Namkeen (GI 34.53), Millet Mix (GI 30.22), Multigrain Roti (GI 39.77) and Khichadi (GI 40.90) were recommended in the Joint Agresco Sub Committee Meeting 2019. Hence these low glycaemic index products are recommended to include in the daily diet plan of diabetic people to maintain the normal blood glucose level.



Tips to control Diabetes



- Eat at least three meals per day
- Do not skip meals. Skipping meals may lead to large swings in blood sugar levels.
- Eat about the same amount of food at each meal.
- Choose foods that are low in fat and saturated fat.
- Choose foods that are low in simple sugar.
- Choose foods that are high in fibre.
- Choose foods that are low in sodium.
- Do exercise regularly.
- Go for thirty minutes walk regularly.
- Take sufficient sleep.
- Get your blood sugar and blood pressure levels checked regularly.